



Will this be my last (manual) fast pitch?

Machine Learning-Enhanced Energy-Product Development

David E. Tew, Ph.D.

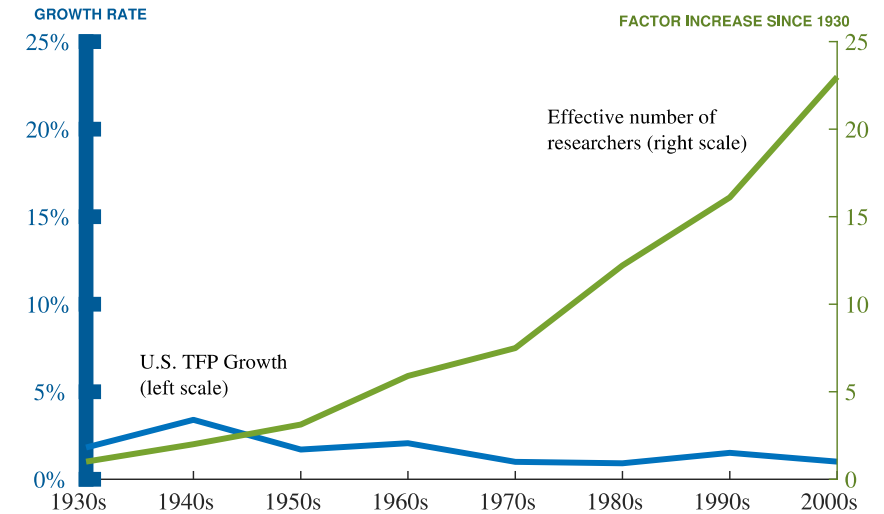
Program Director

March 13, 2018

Summary

- ▶ What?
 - Lower cost energy products & services
- ▶ Why?
 - Lower research productivity
 - Daunting energy & environmental challenges
- ▶ How?
 - Develop & employ ML-enhanced product developed tools

Aggregate Evidence



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What is ML?



Google Search

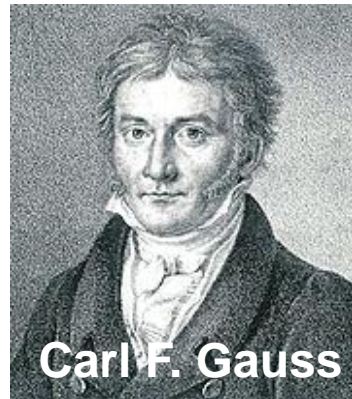
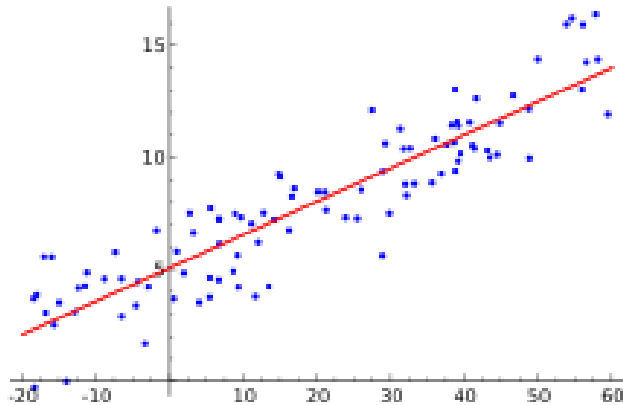
I'm Feeling Lucky



Dog Emma

What is the magic?

Method of Least Squares



Ref: [Wikipedia](#)

1795

Regression

How is it relevant?

Example → Dimensionality Reduction



Emma

Complex

Simple

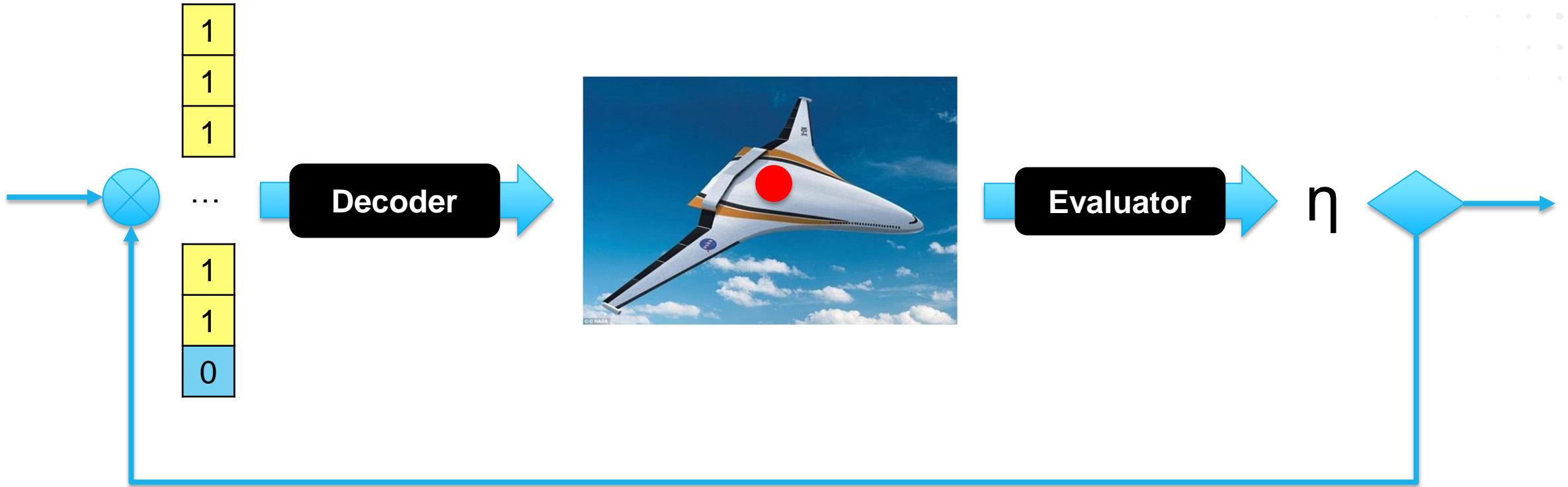


Complex

Simple
(Lower Dimensional
Representation)

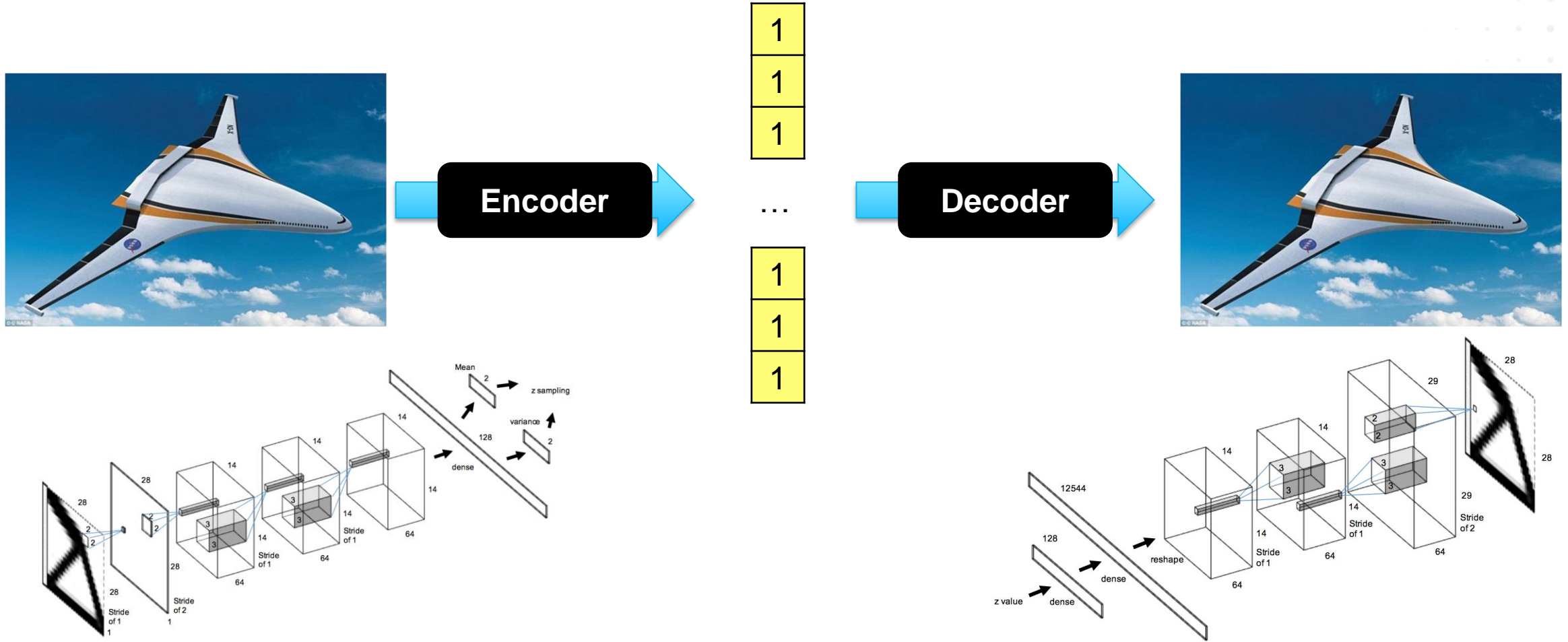
How is it useful?

Example → Optimization in lower dimensional space (E.g. Max η subject to constraints)

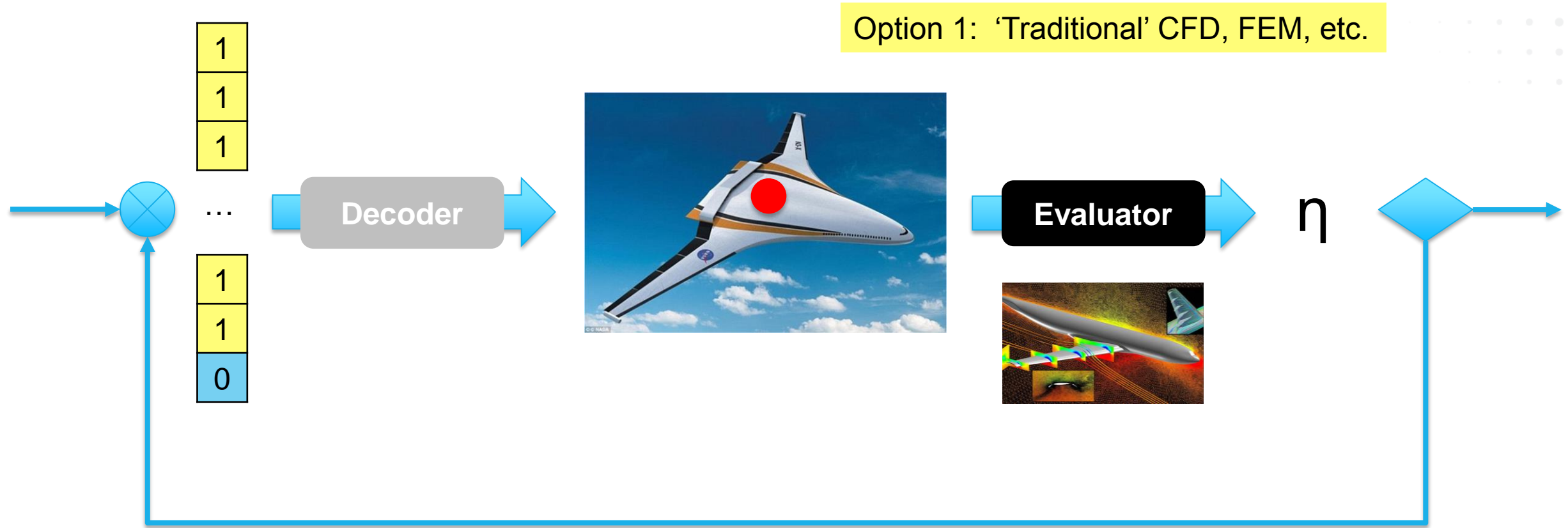


What is in the black boxes?

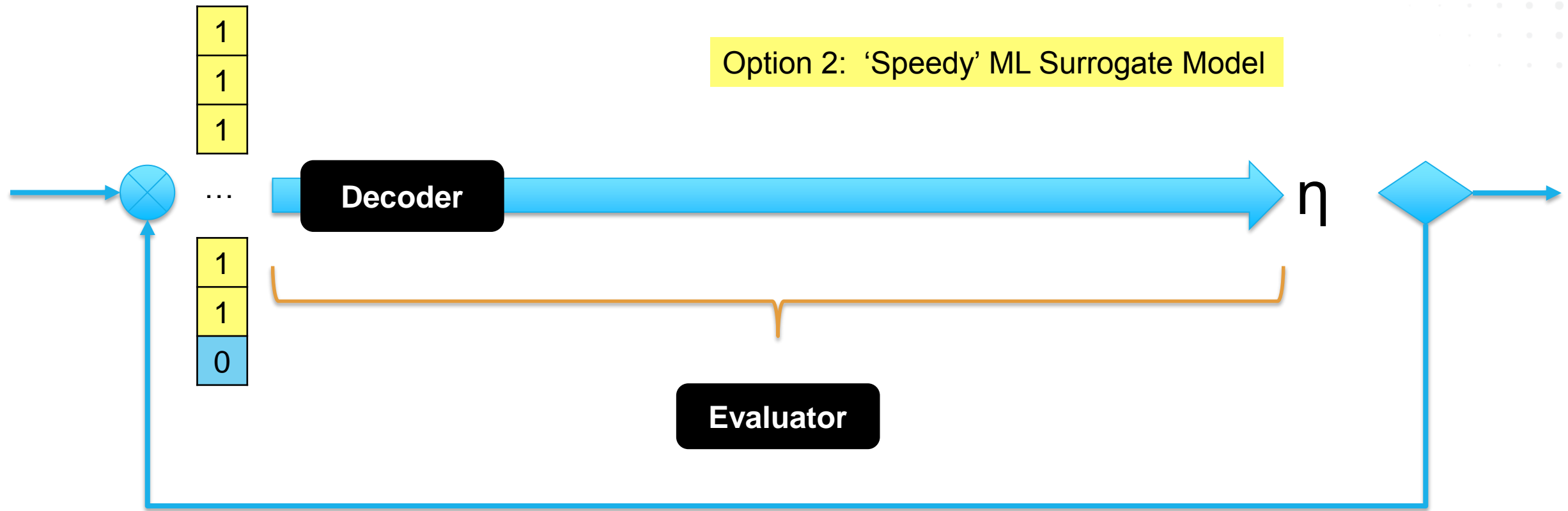
Encoder/Decoder → Convolutional Neural Networks



What is in the black boxes?



What is in the black boxes?



Design Trade

Must weigh cost of designing & training networks vs anticipated benefits



Complex



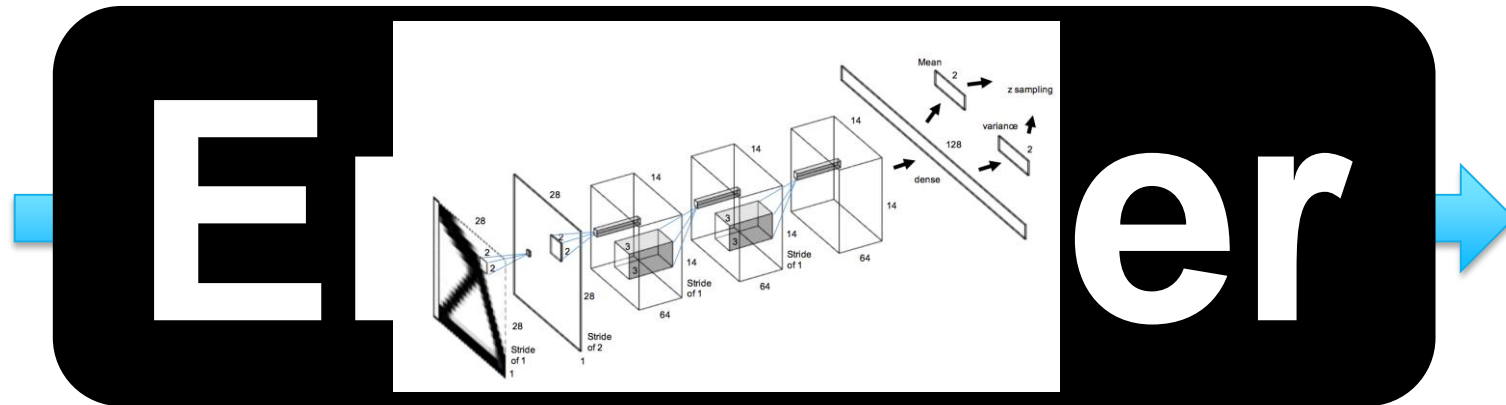
Simple

Design Trade

Must weigh cost of designing & training networks vs anticipated benefits



Complex



Very Complex!

Requires

- Data
- Computing Power
- Engineering Talent

Simple



Next Steps

- ▶ Afternoon panel discussion (3:45 – 4:45, National Harbor 10)
- ▶ Summit feedback (or david.tew@hq.doe.gov)
- ▶ Potential workshop
- ▶ Begin (manually) preparing next year's fast pitch